Assessment of Performance on the Appendix F Hazardous Waste Minimization Goal

Background

The Laboratory met the DOE Pollution Prevention 2005 goals for Hazardous Waste Minimization as of the end of FY 2000 through aggressive pollution prevention activities. In FY 2001 the Laboratory, as part of the UC contract Appendix F performance measures, committed to reduce or maintain routine, Hazardous waste generation at the FY 2000 routine waste generation amounts. Increased waste generation volumes over FY 2000 numbers required management assessment to evaluate actions needed to maintain generation rates below the 2005 goals. By the third quarter of FY 2001 the quantity of hazardous waste generated at the Laboratory had increased to the point that Appendix F performance of "good" can not be met. This report is a management assessment of the situations that led to the unexpected increase in hazardous waste generation and evaluation of potential remedial actions.

The Routine Hazardous Waste Stream

Routine hazardous waste includes two waste types: RCRA waste and State Special solid waste. This waste generation results from production, analytical, and/or other R&D laboratory operations; non-legacy-waste treatment, storage, and disposal operations; and "work for others" or any other periodic and recurring work that is considered ongoing.

In FY 2000 the Laboratory generated 22,183 kg of routine hazardous waste. In FY 2001 routine hazardous waste generation is projected to increase to 48,652 kg.

The thirteen largest waste streams in the routine hazardous waste category for FY 2001 are shown in Figure 1. The largest stream is unused/unspent chemicals, which comprises more than 30% of all routine hazardous waste. Ferric chloride, oil and corrosives have been constituents, in varying quantities, of the hazardous waste stream for several years. The "other" category is composed largely of lab trash, used laboratory glassware, contaminated rags and small quantities of used/spent lab equipment such as HEPA filters.

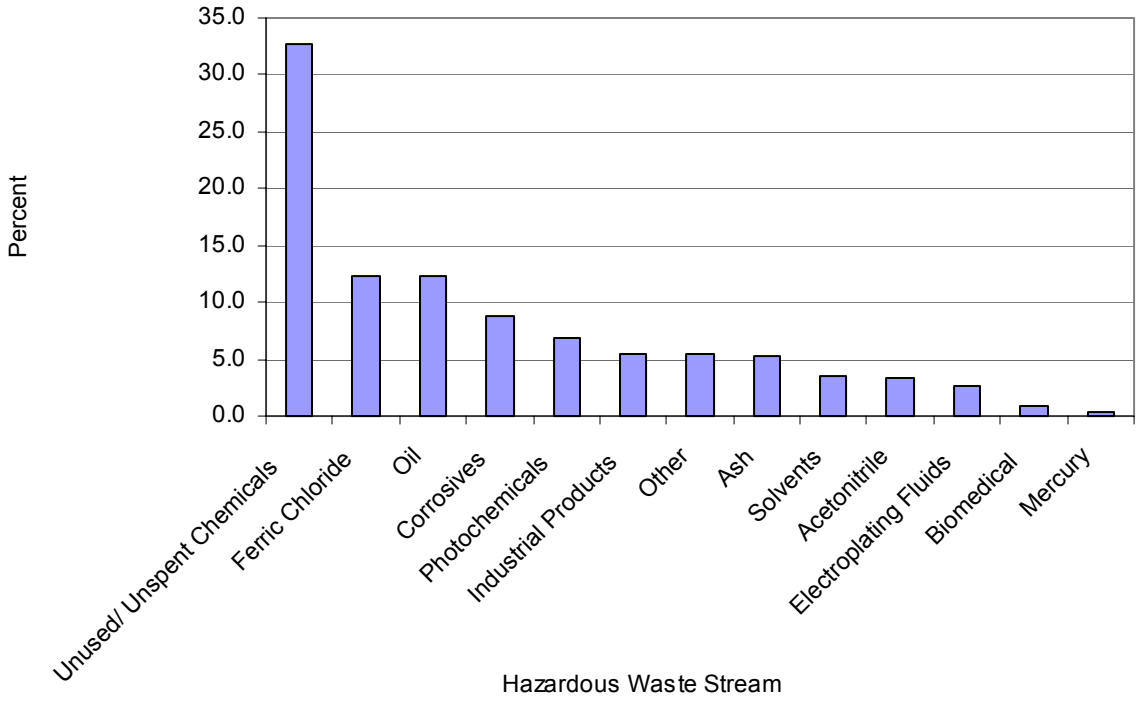

Figure 1. FY 2001 routine hazardous waste streams

It is useful to compare FY 2001 projected waste quantities to the previous year. Such a comparison reveals which streams are persistent year-to-year and whether new streams are emerging. The following table compares the larger waste streams for the past two years.

Waste Stream	**FY 2000 (kg)**	**Projected FY 2001 (kg)**
Unused/Unspent Chemicals	8857	14850
Ferric Chloride	3696	4034
Oil	1796	4040
Solvents	1329	1171
Acetonitrile	~1000	1000
Corrosives	603	2905
Photochemicals	229	2233

* Projections based on quantities disposed through 8/30/01

The cleanout and disposition of unused/unspent chemicals increased 50%. In the short term, it is very important to identify excess chemicals without probable future uses and remove them from the Laboratory. In the longer term, it will be important to implement better chemical management practices so that chemicals

don't accumulate year-to-year. Photochemical disposition increased dramatically in FY 2001 because of the suspension of recycling in this waste stream. Oil wastes also increased primarily due to disposition of oil contaminated absorbents from spill cleanup.

DOE 2005 Hazardous Waste Minimization Goal

In a November 12, 1999 memorandum, the Secretary of Energy established a 2005 goal to reduce hazardous waste from routine operations by 90%, using a CY 1993 baseline. The Los Alamos CY 1993 baseline quantity was 307,000 kg so the FY 2005 target is 31,000 kg.

The measure in the UC contract Appendix F performance measure for hazardous waste is more restrictive than the DOE 2005 goal since it requires the Laboratory to generate no more than the FY 2000 quantity of hazardous waste or 22,183 kgs.

The Laboratory's past performance in hazardous waste generation is shown in Figure 2.

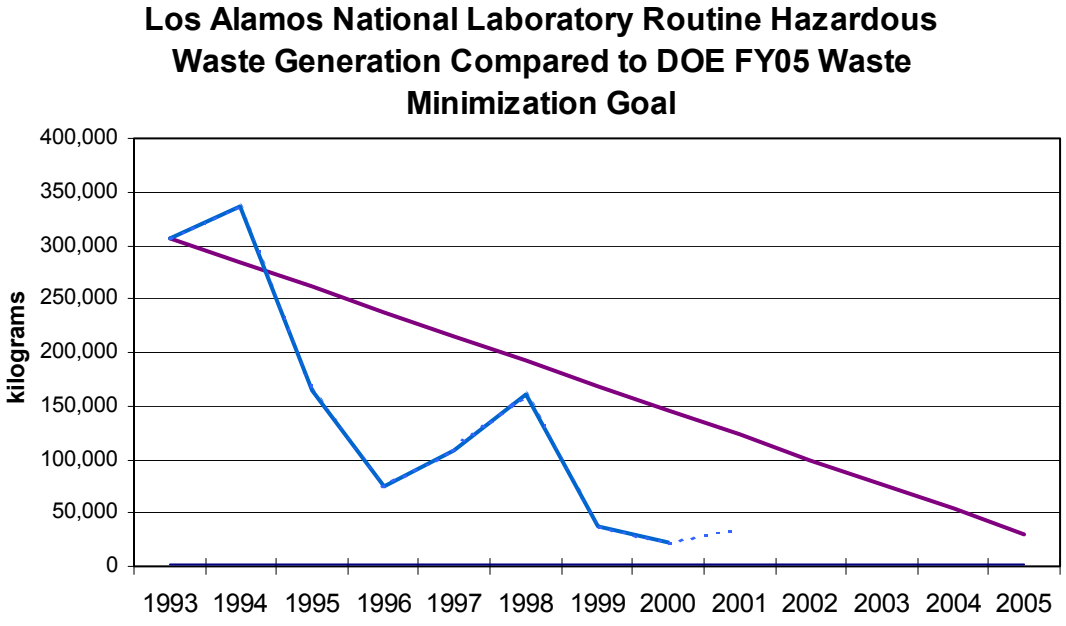

Figure 2. Hazardous waste trend

Although the trend over the last several years has been very good, the Laboratory is projected to dispose 48,652 kg (48.6 Metric Tons) of hazardous in FY 2001and is now above the FY 2005 goal. This will result in an Appendix F performance measure rating of Unsatisfactory.

The following graph represents actual Laboratory waste generation in FY 2001, through the third quarter, compared to the Appendix F Waste Minimization goals.

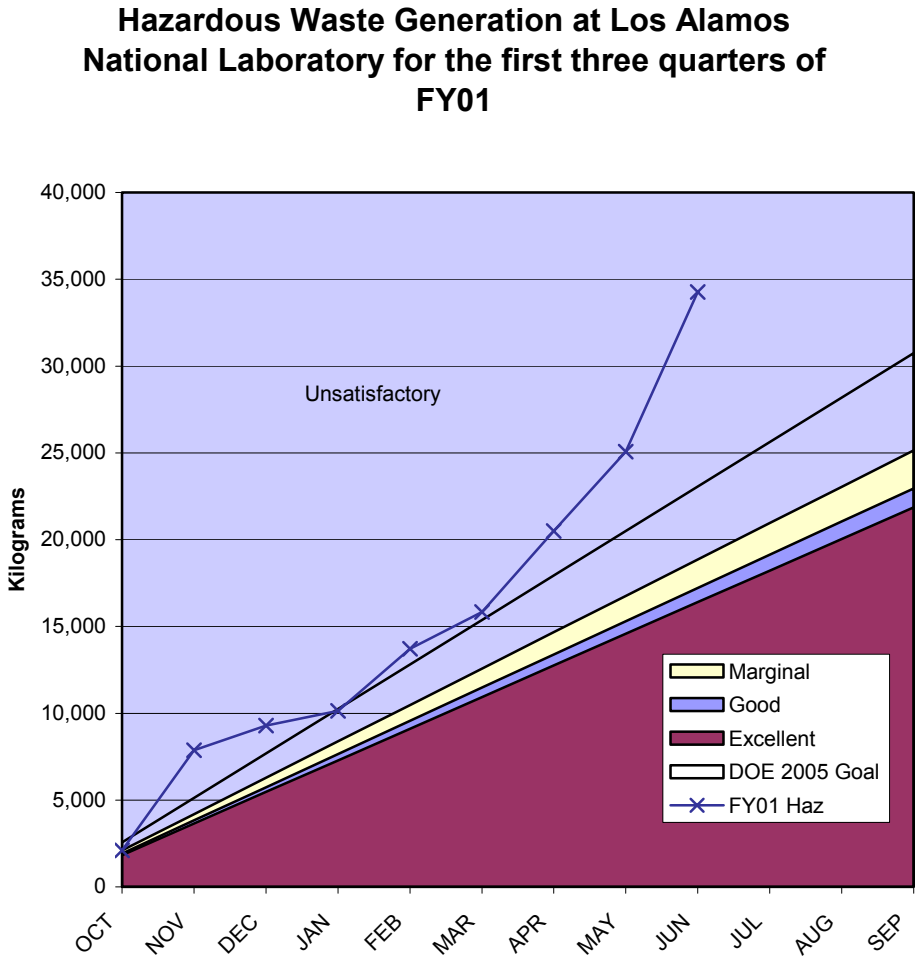

Fig. 3. Hazardous waste disposal through the 3rd Quarter FY 2001

Analysis of Causes of Unsatisfactory Performance

A major factor in increased hazardous waste generation was the disposal, in FY 2001, of hazardous wastes that have traditionally been recycled. Approximately 10,250 kg of hazardous waste that could have been recycled were instead sent off-site for disposal. This action resulted from a conflict between the Laboratory Appendix F performance measure for hazardous waste minimization and the Waste Management performance measure to process waste as quickly and cost effectively as possible. The cost to recycle waste is currently higher than the cost to dispose. In addition spent materials to be recycled frequently have to be accumulated until there is a full truck load. Thus disposal was chosen over recycling. This issue has been resolved and wastes that can be recycled will be recycled in the future.

In addition, it is estimated that 15,000 kg of unused, unspent chemicals will be disposed in FY 01 compared to 8,000 kg in FY 2000. This increase is attributed to a continuing emphasis on reducing chemical inventories, and to NMED interest in chemical stores during a recent RCRA audit. Also, a Green Zia tools analysis of chemical practices at TA-48, RC-1 stimulated over 3,000 kg of additional unused/unspent chemical disposal.

Proposed Actions

The major contributor to the poor performance on the hazardous waste measure arose out of the conflict between the waste minimization performance measure and the FWO division performance measure. This problem has now been rectified and in the future all recyclable waste will be recycled. The Laboratory will keep record of increased costs due to recycling and discuss this with DOE in the future. No additional action is required.

The increase in disposal of unused, unspent chemicals also contributed to poor hazardous waste minimization performance. In the short term, it is very important to identify excess chemicals without probable future uses and remove them from the Laboratory. In the longer term, increased emphasis on buying only as much chemical as needed for planned work and improved chemical accountability should reduce the amount of unused, unspent chemicals disposed.

These actions address the most immediate causes of increased hazardous waste generation. However, the Laboratory is committed to continuously reducing hazardous waste. The next section describes several waste minimization actions underway or planned that are intended to further reduce the waste in the largest routine waste streams.

Ongoing Projects

These projects have been implemented in the past 12 months and have already had an effect on the hazardous waste stream. They will continue in the future and certain projects may be expanded.

> **Hydraulic systems improvements.** JCNNM is redesigning hydraulic couplings on backhoes and other machinery to reduce the likelihood of coupling failure and the resulting oil spills. Oil spill clean-up generates NM state special waste. JCNNM is replacing the oldest Pakmaster (trash compacting truck), which has had frequent hydraulic line failures. (These improvements are based on a Green Zia Tools assessment conducted by JCNNM in FY 2000.)
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> **Bio-based hydraulic oil**. JCNNM is converting Laboratory heavy equipment to use bio-based hydraulic oils. These are not regulated as

hazardous waste; consequently, oil spills and spill cleanup become sanitary waste. (Sandia has already implemented this.)

Non-RCRA waste water pretreatment. The JCNNM-managed Sanitary waste water plant (SWS) has configured a waste water pretreatment trailer to process waste waters that do not meet the SWS plant Waste Acceptance Criteria. These are now disposed as state special solid waste. Once treated, they can be sent to SWS. Floor stripper (for removing wax) and mop water from some floor cleaning operations are examples of this kind of waste.

Ferric chloride recycle/disposition. Ferric chloride suppliers will pick up ferric chloride waste for recycle or disposal. This will eliminate this waste stream in the future.

Proposed Projects

These projects have been proposed to allow further reduction in the routine hazardous waste stream, to improve operational efficiency and, in the case of fixing finely divided powders, to increase safety. If implemented they will provide additional margin against unexpected and unplanned increases in waste generation. The projects are presented in the order of waste streams they are intended to reduce, with the largest streams first.

Distributed chemical pharmacy. The Laboratory is in the process of procuring a new chemical management software system. This will create the opportunity for much more effective management of chemicals, both maintenance/production chemicals, and research chemicals. This project will develop and implement site-wide procedures for sharing and exchanging chemicals, for minimizing the amount of chemicals purchased, and for implementing an external chemical exchange system. The external exchange system will enable the Laboratory to share excess chemicals with other institutions. This will be a distributed system in that chemicals will not be stored or dispensed from a central facility. This project should have an impact on the unused chemical and the solvent waste streams, which are large and persistent.

Oil waste reduction. The expansion of on-going programs (see above) is expected to reduce this waste stream significantly over the next two to three years.

Digital photography implementation. The photochemical waste stream is one of the large components of FY 2001 hazardous waste. The Laboratory has gradually been making the transition from film and wet chemistry photodevelopment to digital photography. The purpose of this project is to complete that transition, including development of Laboratory

photographic and x-ray photographic standards that would preclude future purchase of film photography and wet film development equipment, except where it is the only possible option. The Project involves replacing wet chemistry systems (cameras, development, and printing) at low volume activities, followed by a change over in the Lab's production photographic services. This project, combined with recycle of photochemical waste, should virtually eliminate this waste stream.

Site wide process neutralization. Currently spent acidic or basic chemicals are disposed as waste. Because of their corrosive nature they are RCRA hazardous waste. By implementing a simple neutralization step at the end of the processing cycle many kilograms of hazardous waste, in the form of corrosives, could be converted to less hazardous NM State Special waste. Neutralized waste should be easier to recycle than the original corrosives.

Acetonitrile. The Laboratory produces about a ton of this waste material per year. The chemical is used in the production of nucleo-peptides. The Laboratory expects programmatic growth which would effectively double yearly production starting in FY 2002. The Laboratory has initiated an investigation of recycling options for this material, including both on and off-site recycle. After evaluating these options the Laboratory will pursue the selected option.

Fixing finely divided powders. Many waste products that are not inherently hazardous are classified as hazardous waste because they are in the physical form of fine respirable powders. By potting, melting or otherwise immobilizing these powders they can be removed from the hazardous waste stream.

Paint shop waste minimization. The JCNNM paint shop generates considerable hazardous waste. During FY 2002 JCNNM will be conducting a Green Zia Tools analysis of lacquer and thinner waste streams to identify waste minimization options.

Heat exchanger cleaner spent solution. Chemical cleaning of cooling tower heat exchangers leads to significant volumes of hazardous waste. The Laboratory is now completing a Green Zia Tools analysis of this waste stream; this identifies several waste minimization strategies which will be pursued in the coming year.

Mercury elimination. Use of mercury-containing devices (thermometers) is a frequent source of hazardous waste. When these break they generate significant hazardous waste. The Lab's pollution prevention program has funded replacement of mercury thermometers with alcohol and electronic ones.

RCRA hazardous materials issues management team. The Laboratory has recently identified RCRA hazardous materials management as a high priority institutional issue under the Integrated Safety Management System. The issue management team has begun collecting information that will enable it to recommend policy changes that will improve material management and reduce the amount of hazardous waste generated.

The combination of these actions will reduce the hazardous waste generation quantities to below the FY 2000 level and provide a robust system against unexpected events that could increase waste generation.